

REMARKS

By the present amendment claims 1 to 4 are pending in the application. Claim 1 is the only independent claim.

§112, ¶2

Claims 1 to 4 were rejected under 35 U.S.C. §112, second paragraph, as being indefinite.

In response to this rejection, claim 1 has been amended by the present amendment to improve clarity, taking into account the comments of the Office Action.

In view of the present amendment, it is respectfully requested that the rejection under 35 U.S.C. §112, second paragraph, as applied to the amended claims, be withdrawn.

§112, ¶1

Claims 1 to 4 were rejected under 35 U.S.C. §112, first paragraph, as based on a disclosure that is not enabling.

This rejection is respectfully traversed.

The Office Action takes the position that the steel plate that suppresses the propagation of cracks due to fatigue is a surface layer ultra-fine granulated steel (SUF) plate with a compressive residual stress in the surface area, that the applicant has not disclosed other combinations of materials and properties other than the use of a SUF plate with a compressive residual stress in the surface layer, and therefore the claims should be limited to a “surface layer ultra-fine granulated steel” (SUF) plate with a compressive residual stress in the surface layer.

However, in the specification, steel sheets having the property of suppressing fatigue crack propagation other than the SUF steel sheet are explained in detail on page 3,

line 35 to page 5, line 19 indicating reference documents, for example, JP-A-6-271985, JP-A-11-1742, JP-A-9-90478, JP-A-2002-120181, JP-A-8-225882, JP-A-11-310846.

Although steel “a” of a kind of steel in Table 1 at page 15 of the specification is a SUF steel, steel “b” to “g” of Table 1 are all steel having the property of suppressing fatigue crack propagation other than the SUF steel. Steels “a” to “g” of Table 1 are discussed in the specification at page 3, line 25 to page 5, line 19.

As explained above, steel sheets having the property of suppressing fatigue crack propagation other than SUF steel sheet are described in detail in the specification.

Regarding combination with steel sheet other than the SUF steel sheet:

As shown in Table 2 at page 16, steels “G” and “H” to which intermediate cooling is applied are the SUF steels. Steels “I”, “J”, “K”, and “L” in the Example are all steels having property of suppressing fatigue crack propagation other than the SUF steel.

As a result, Nos. 18, 20, 22, 24 in Table 4 at page 18 of the Example of the specification show experimental results of combinations of steel plates having the property of suppressing fatigue crack propagation other than the SUF steel plate, and excellent improvement of fracture life time for these steel plates is clearly shown in these Examples of the specification.

As explained above, the present specification discloses steel plates, other than SUF steel, having the property of suppressing fatigue crack propagation and experimental results of combinations of steel plates having the property of suppressing fatigue crack propagation.

It is therefore respectfully requested that the rejection under 35 U.S.C. §112, first paragraph, be withdrawn.

§103

Claims 1 to 4 were rejected under 35 U.S.C. §103(a) as being unpatentable over the applicants' disclosure of the Background Art at pages 1 to 3 of the specification in view of U.S. Patent No. 6,171,415 to Statnikov.

This rejection is respectfully traversed.

Patentability

The Office Action takes the position that it is obvious for a person skilled in the art to combine means of improving fatigue life-time using ultrasonic impact treatment disclosed in Statnikov with a steel sheet having the property of suppressing fatigue crack propagation in a circularly welded joint where problems of fatigue cracks is raised.

Applicants respectfully disagree with the position of the Office Action.

It is important to improve the fatigue strength of a circularly welded joint since load is repeatedly added thereto, and prior art means for improving the fatigue strength have been only 1) grinding, 2) TIG dressing, 3) shot peening or 3) hammer peening. Specification, page 1, lines 31 to 35.

There has been no disclosure or suggestion in the prior art to use a steel sheet having the property of suppressing fatigue crack propagation in order to improve fatigue strength of a circularly welded joint.

It is submitted that the present invention is a remarkable invention which applies a steel sheet having the property of suppressing fatigue crack propagation to a circularly welded joint for the first time.

As shown in Table 4 at page 18 of the Example of the specification, when means of ultrasonic impact treatment is applied to an ordinary steel sheet which is not a steel sheet having the property of suppressing fatigue crack propagation, fracture life time thereof

results in 2.1 to 2.3 times the ordinary circularly welded joint, and the improvement effect is 1.1 to 1.3 times the ordinary circularly welded joint by subtracting the life time of the ordinary one from the above.

However, when means of ultrasonic impact treatment is combined with a steel sheet having the property of suppressing fatigue crack propagation, fracture life time thereof results in 3.5 to 4.2 times the ordinary circularly welded joint.

In the case of a circularly welded joint where only a steel sheet having the property of suppressing fatigue crack propagation is used without using means of ultrasonic impact treatment, the fatigue life time results in 1.8 to 2.2 times the ordinary circularly welded joint, i.e., a balance 1.7 to 2.0 times the ordinary circularly welded joint of the improvement effect on elongation of fracture life time is exhibited.

That is, the improving effect on elongation of fracture life time obtained by the combination of means of ultrasonic impact treatment with the steel sheet not having property of suppressing fatigue crack propagation is small 1.1 to 1.3 times the ordinary circularly welded joint.

However, according to the present invention, the improving effect on elongation of fracture life time of 1.7 to 2.0 times the ordinary circularly welded joint can be obtained.

This effect exceeds that of simply summing up the effects of these two steps.

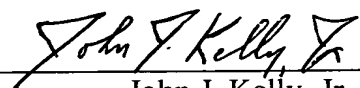
It is therefore submitted that claims 1 to 4 are patentable over the Background Art in view of U.S. Patent No. 6,171,415 to Statnikov.

CONCLUSION

It is submitted that in view of the present amendment and the foregoing remarks, the application is now in condition for allowance. It is therefore respectfully requested that the present amendment be entered and the application, as amended, be allowed and passed to issue.

Respectfully submitted,

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